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Griffin et al.

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(54) **CIRCULAR SUCTION OUTLET ASSEMBLY AND COVER**

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E04H 4/12	(2006.01)
E04H 4/14	(2006.01)

(52) **U.S. Cl.**

CPC ***E04H 4/1236*** (2013.01); ***E04H 4/14*** (2013.01)

USPC **4/507**

(58) **Field of Classification Search**

CPC E04H 4/1236; E04H 4/14

USPC 4/204, 507, 510, 512, 679, 688, 689, 4/286, 293, 294, 287, 295; D24/204

See application file for complete search history.

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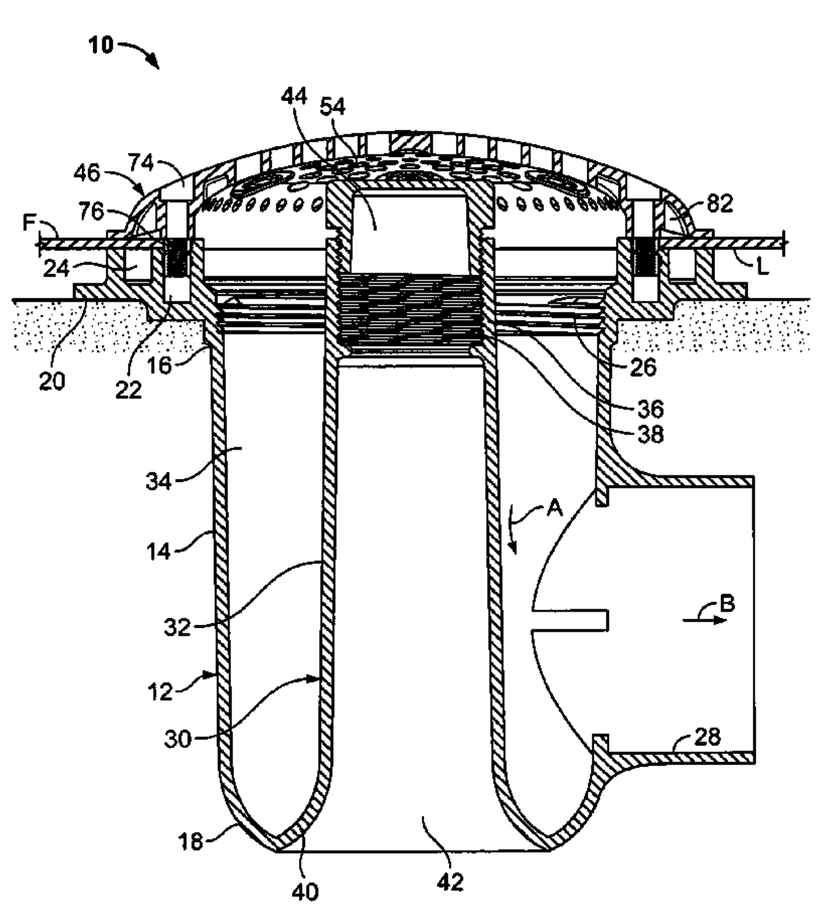
(57) **ABSTRACT**

A circular suction outlet assembly is provided for use in swimming pools, spas, and the like, which includes a sump body having a central stem which forms an annular space within the sump body, and a nozzle which communicates with the annular space to convey water to the swimming pool drain circuit. A circular, domed-shaped cover is removeably fitted to the top of the sump body. Safety features of the suction outlet assembly include openings in the cover arranged to allow a bather to safely break a seal formed between a body part and the cover. In the event the cover becomes separated from the sump body, the annular space and the central stem also inhibit the insertion and entrapment of human body parts in the sump body.

8 Claims, 8 Drawing Sheets



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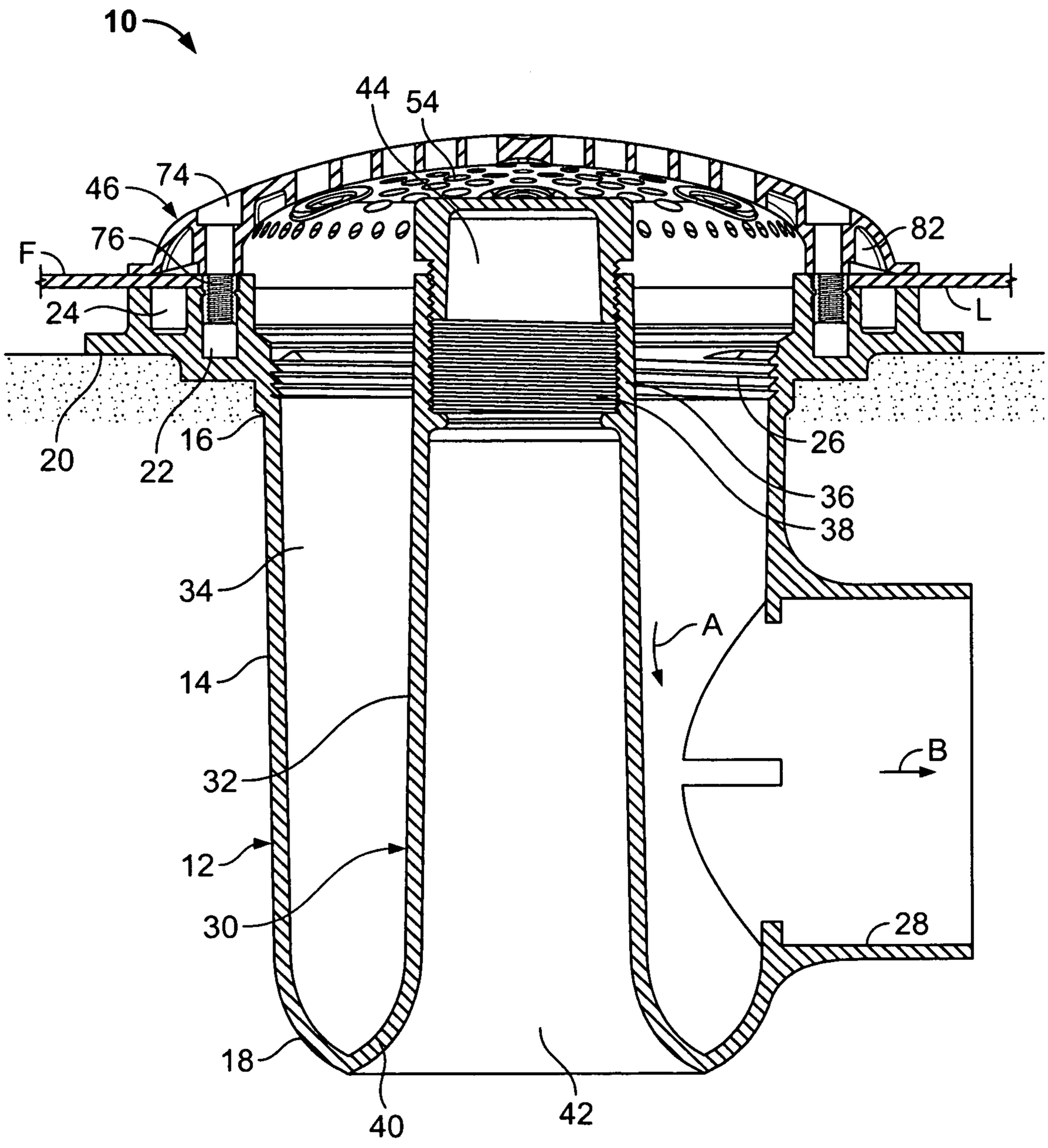
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FIG. 1

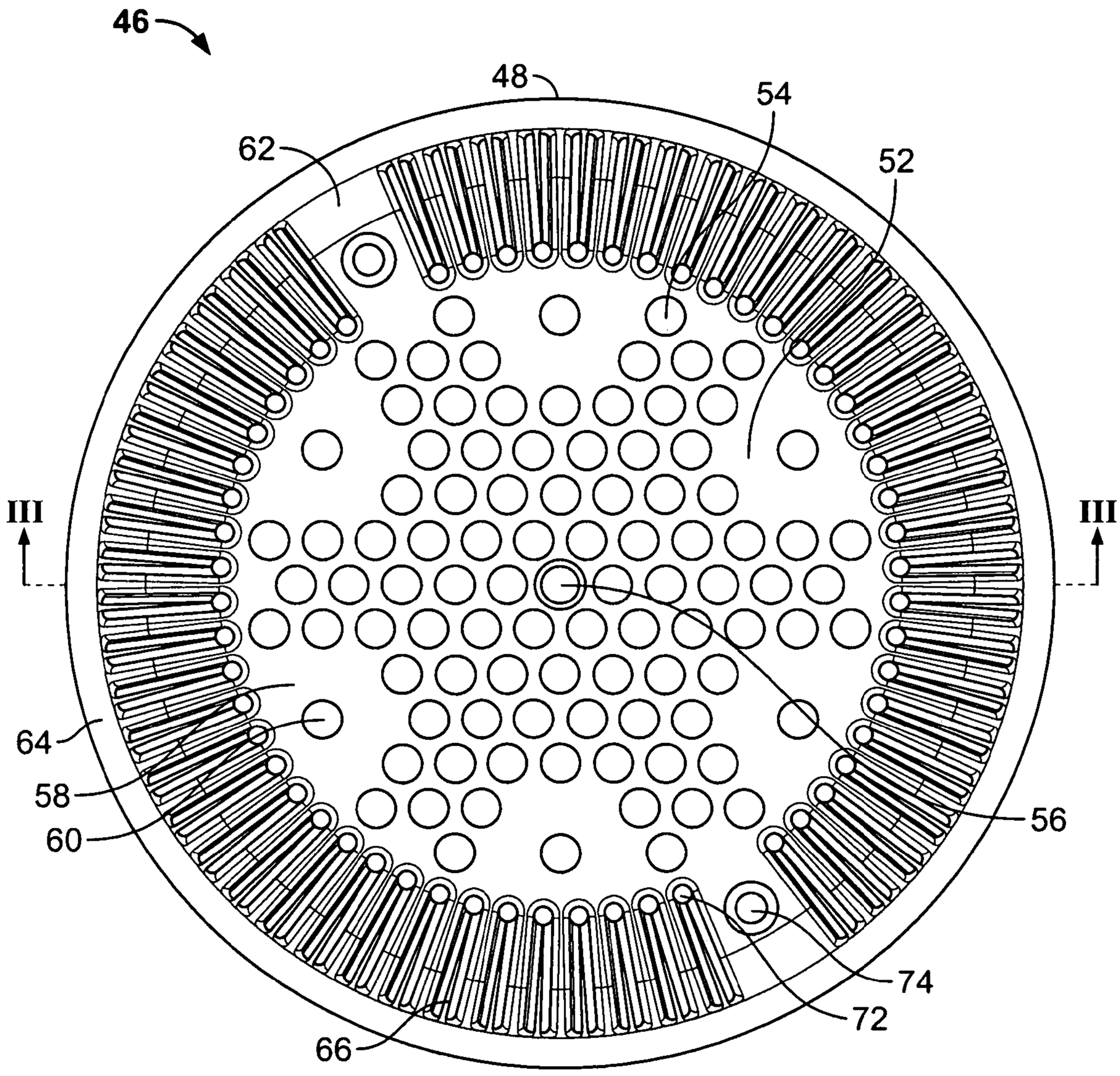

FIG. 2

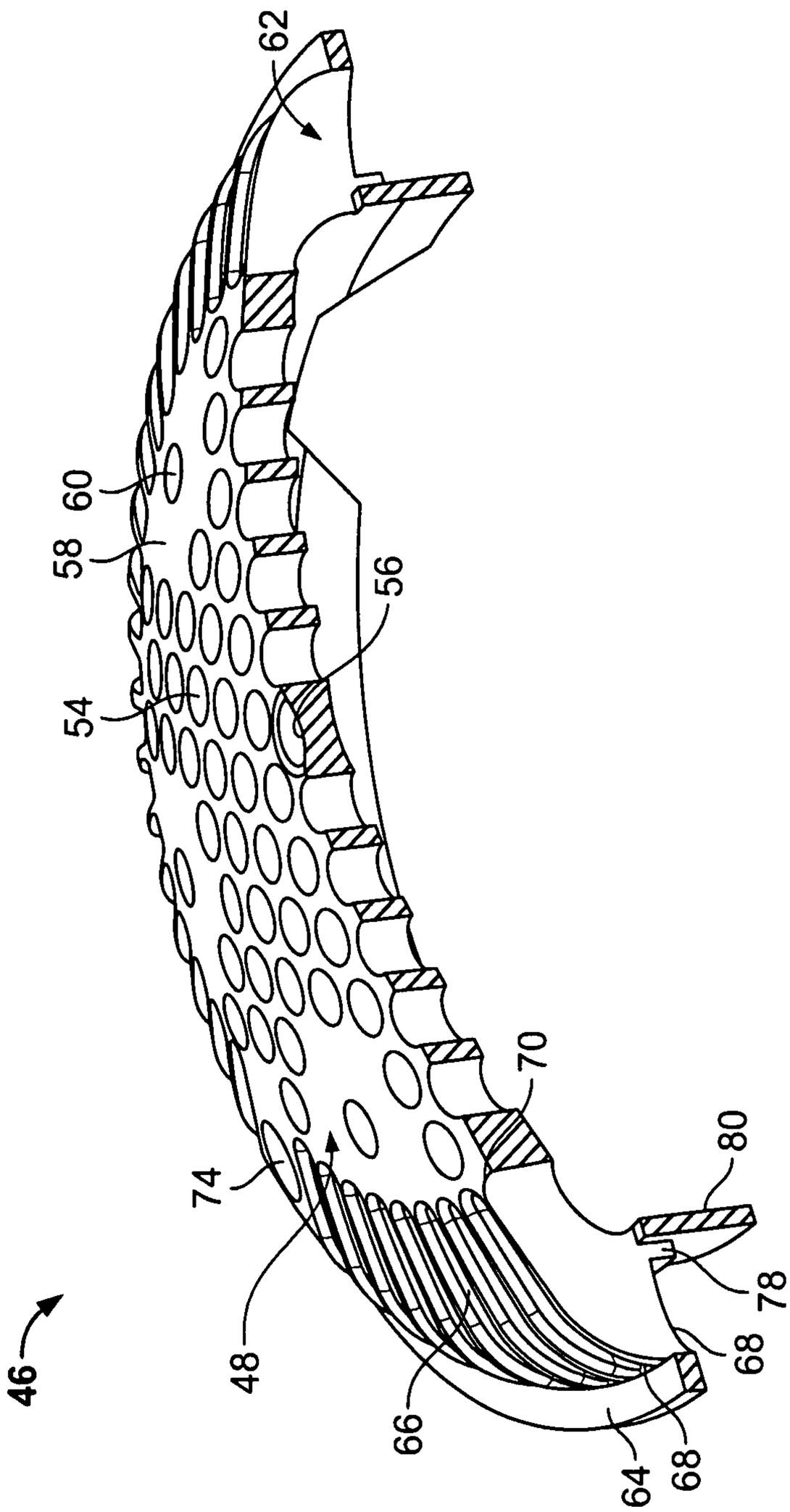

FIG. 3

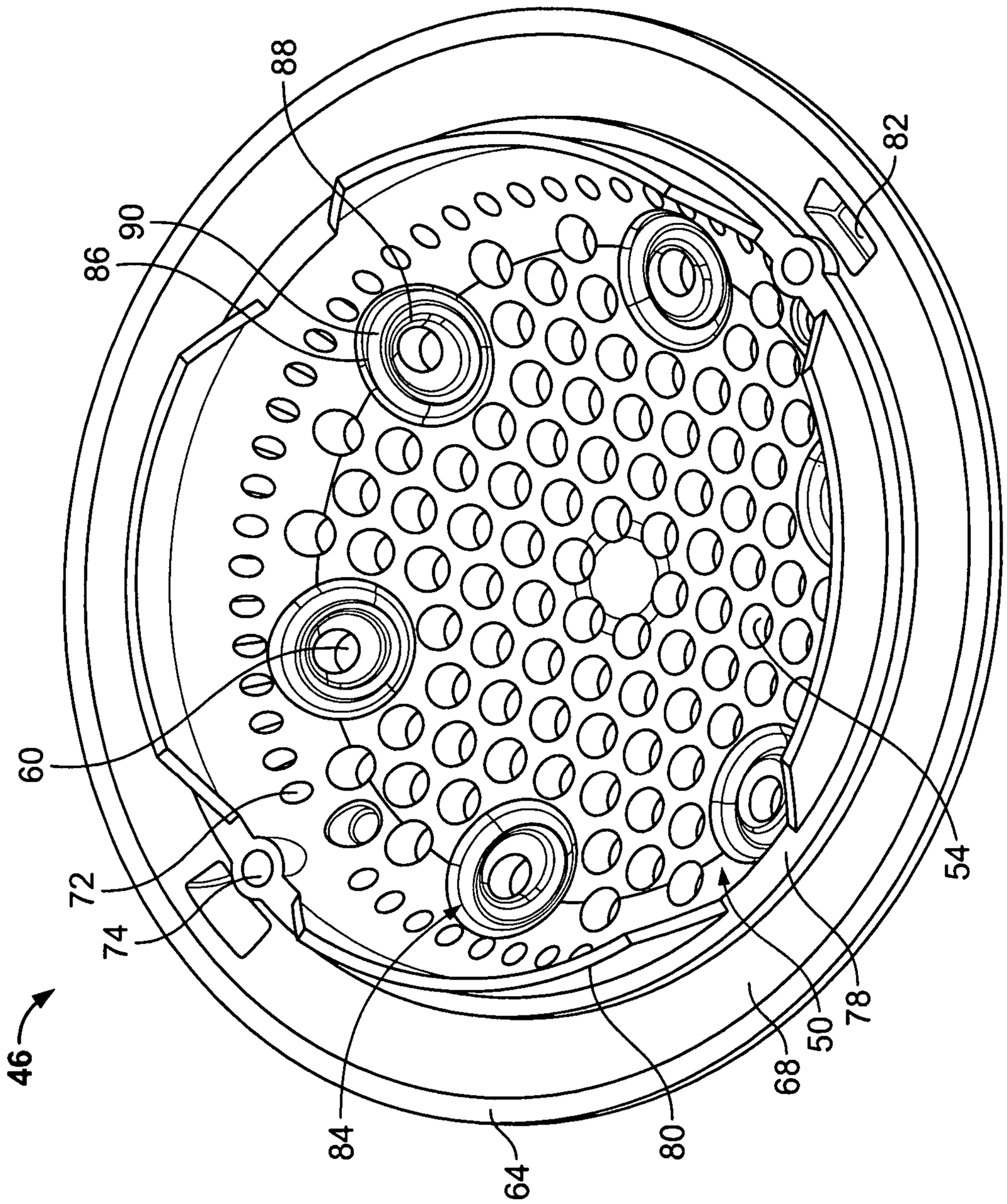

FIG. 4

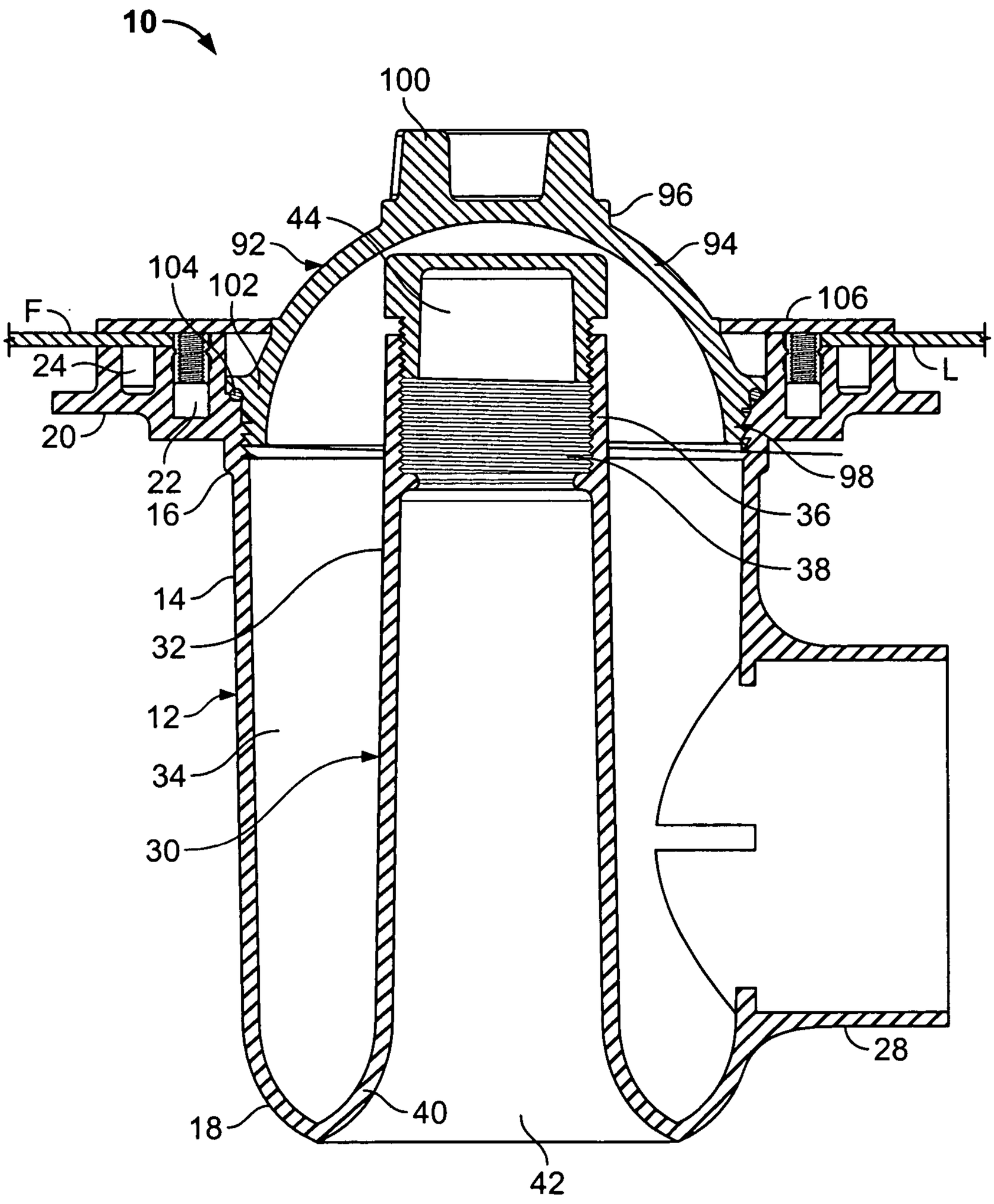
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FIG. 5

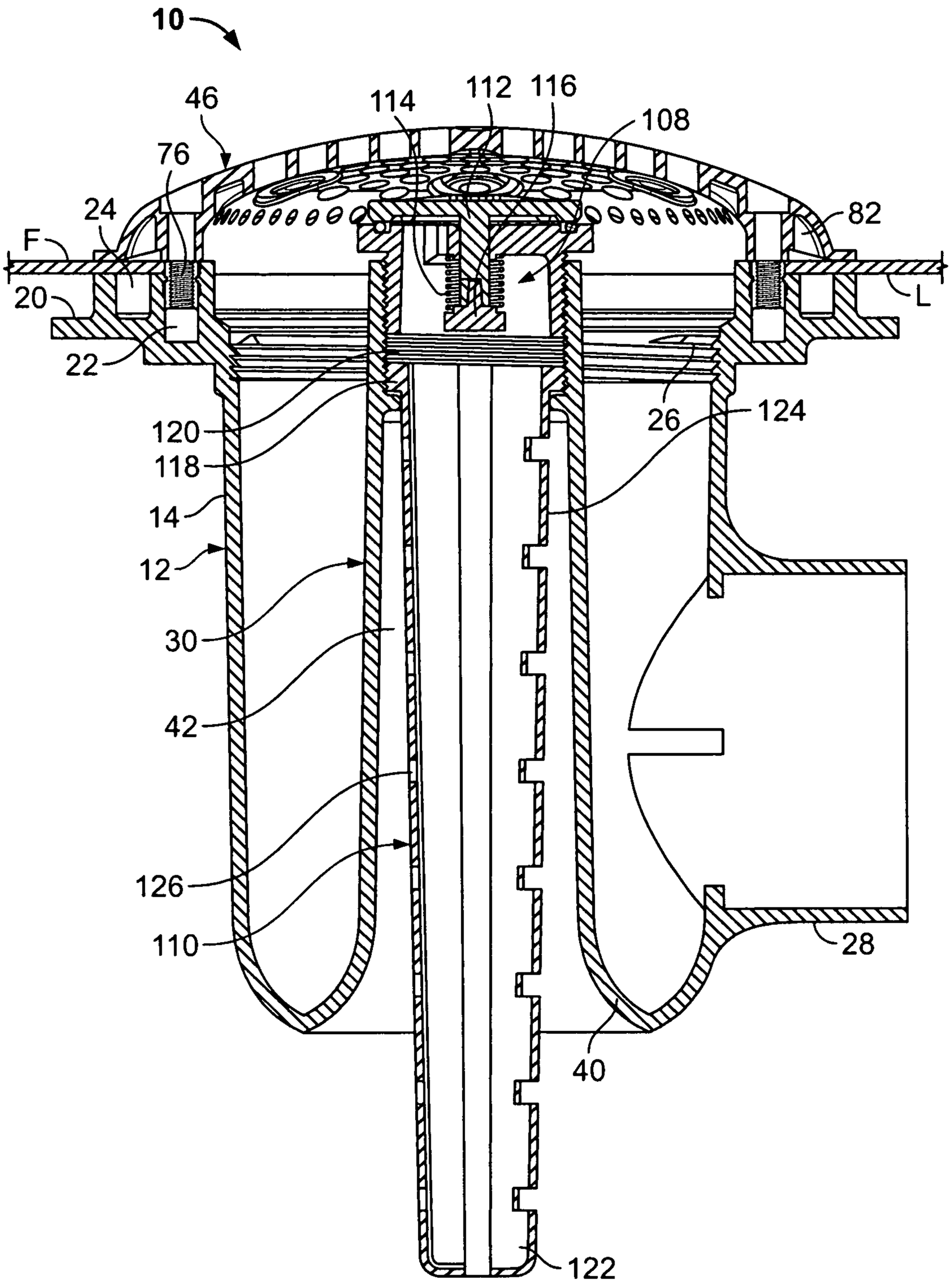
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FIG. 6

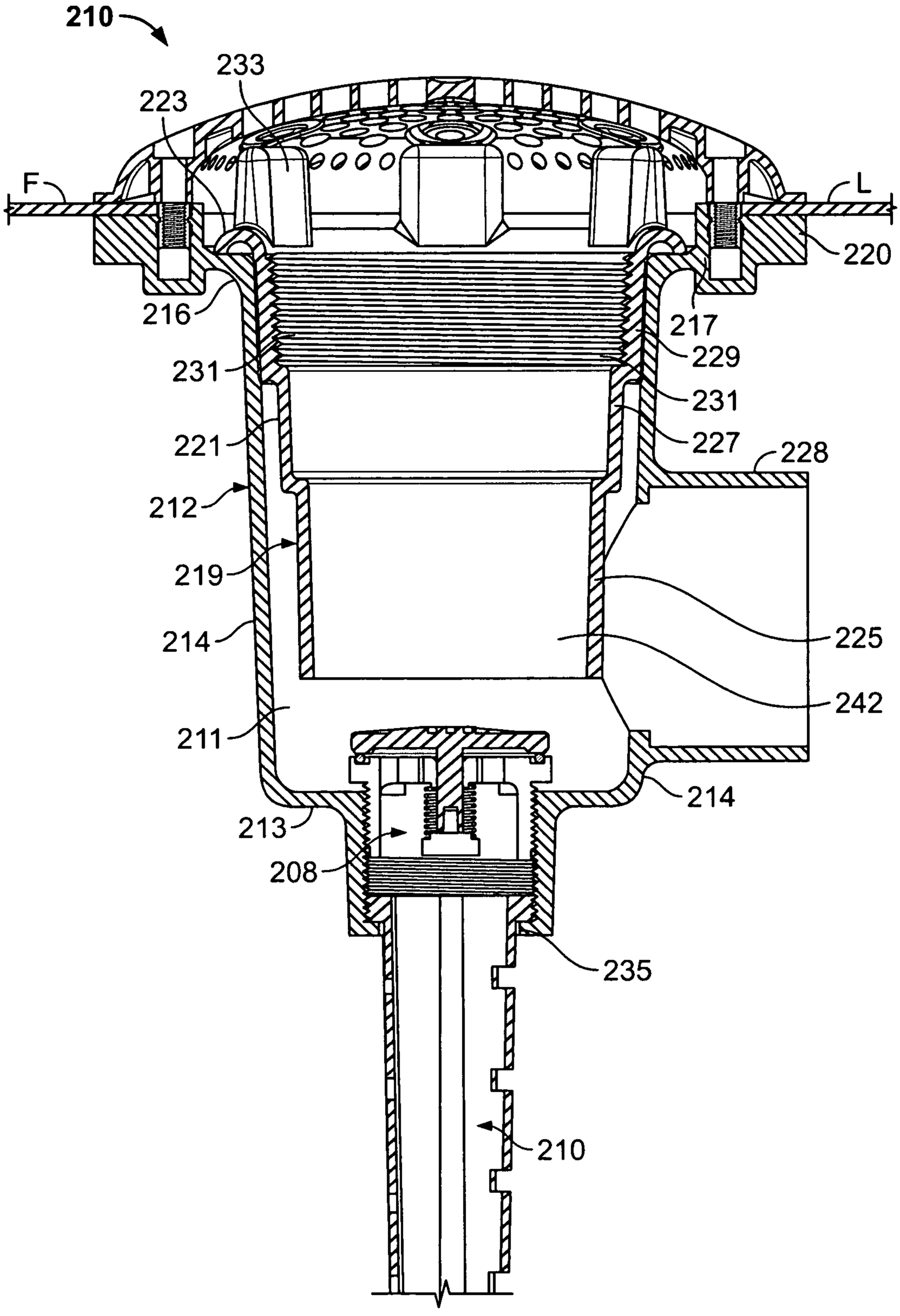
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FIG. 7

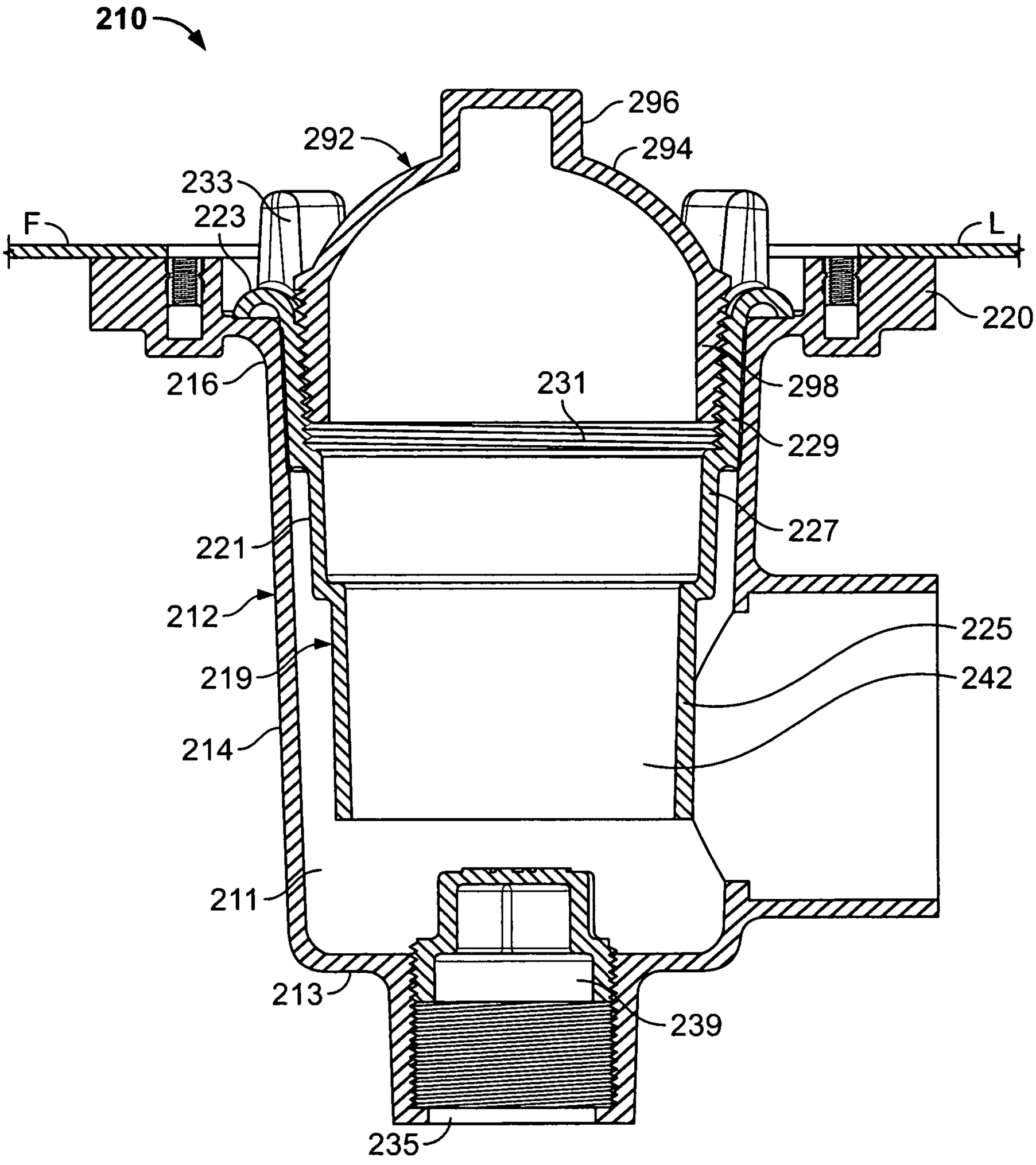
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FIG. 8

CIRCULAR SUCTION OUTLET ASSEMBLY AND COVER

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority of U.S. Provisional Patent Application Ser. No. 60/716,545 filed Sep. 13, 2005, the disclosure of which is incorporated by reference herein in its entirety.

FIELD OF THE INVENTION

The present invention relates to suction outlet assemblies and, more particularly, to such assemblies adapted for use in swimming pools and spas.

BACKGROUND OF THE INVENTION

A conventional water circulation system for a swimming pool is equipped with a suction outlet formed in the floor or wall of the pool. The suction outlet is connected to a suction pipe which is attached to a pump or gravity flow collector vessel. Water is thereby drawn into the circulation system through the suction outlet. For safety reasons, the suction outlet is typically covered with a perforated cover in order to prevent large objects, such as human body parts, from being sucked into the suction outlet.

Conventional covers and their underlying suction outlets have various shortcomings and disadvantages. For example, if a bather completely obstructs the perforated cover, there is a risk that human body parts can be undesirably held against the suction outlet, raising the possibility of drowning. Further, if the cover is accidentally displaced from the suction outlet, human body parts can be drawn into the exposed suction outlet or piping. In such circumstances, there is a need for a suction outlet assembly that includes safety features for the cover and the suction outlet.

SUMMARY OF THE INVENTION

The present invention overcomes the disadvantages and shortcomings discussed above by providing a new and improved suction outlet assembly, which is equipped with various safety features. For example, the suction outlet assembly includes a stem that serves to limit access to the outlet pipe. A perforated cover is dome shaped in order to inhibit bathers from completely blocking all of the openings formed in the cover. Further, the suction outlet assembly can optionally be provided with a hydrostatic relief valve which is used to relieve hydrostatic pressure, thereby preventing the buildup of excessive ground water pressure underneath the swimming pool which could float the pool. Another feature is a test cap used to perform hydrostatic pressure testing of the suction outlet assembly and circulation system piping.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is made to the following detailed description of various exemplary embodiments of the present invention considered in conjunction with the accompanying drawings, in which:

FIG. **1** is a cross-sectional view of a suction outlet assembly which includes a removable cover and a plug, and which has been constructed in accordance with a first exemplary embodiment of the present invention;

FIG. **2** is a top view of the cover shown in FIG. **1**;

FIG. **3** is a perspective sectional view, taken along section line III-III of FIG. **2** and looking in the direction of the arrows, of the cover shown in FIG. **2**;

FIG. **4** is a bottom perspective view of the cover shown in FIG. **2**;

FIG. **5** is a cross-sectional view similar to that of FIG. **1**, except that the cover has been removed and replaced by a hydrostatic pressure test cap;

FIG. **6** is a cross-sectional view similar to that of FIG. **1**, except that the plug has been replaced with a hydrostatic relief valve and a collector tube;

FIG. **7** is a cross-sectional view of a suction outlet assembly which has been constructed in accordance with a second embodiment of the present invention and which includes a removable cover, a hydrostatic relief valve, and a collector tube; and

FIG. **8** is a cross-sectional view similar to that of FIG. **7**, except that the cover has been removed and replaced by a hydrostatic pressure test cap, and the hydrostatic relief valve and the collector tube have been removed and replaced by a plug.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

Referring to FIG. **1**, a suction outlet assembly **10** is adapted for mounting in a floor (F) or wall of a swimming pool. The suction outlet assembly **10** includes a cup-shaped sump body **12** having an outer wall **14** with an upper end **16** and a lower end **18**. The sump body **12** also has a flange **20** that extends outwardly from the upper end **16** of the outer wall **14**. A first set of apertures **22** is formed in the flange **20** for reasons to be described hereinafter, and a second set of apertures **24** is formed in the flange **20** to secure a clamping member (not shown) for membrane pool liners (e.g., a vinyl liner (L)). The sump body **12** has internal threads **26** for purposes to be discussed hereinafter. A nozzle **28** is formed in the outer wall **14** of the sump body **12** and is provided for discharging water flowing through the sump body **12** to a pump (not shown).

With continued reference to FIG. **1**, the suction outlet assembly **10** also includes a central stem **30** having a substantially cylindrical, elongated wall **32** which is positioned within the outer wall **14** of the sump body **12**. In other words, the wall **32** of the central stem **30** has a diameter which is less than the diameter of the outer wall **14** of the sump body **12**. As a result of their generally coaxial arrangement, the wall **32** of the central stem **30** and the outer wall **14** of the sump body **12** cooperate to form an annular space **34** therebetween. The central stem **30** has an upper end **36** with internal threads **38** for purposes to be discussed hereinafter. The central stem **30** has a lower end **40** which curves outwardly toward the sump body **12** and is integrally formed with the lower end **18** of the sump body **12**. A bore **42** is formed in the central stem **30**, extending along the entire length thereof. Still referring to FIG. **1**, a plug **44** threadedly engages the internal threads **38** formed on the upper end **36** of the central stem **30** so as to seal the top end of the bore **42**. As will be described in further detail hereinafter, the central stem **30** is employed for safety reasons and also provides a flow path for ground water.

With reference to FIGS. **1-4**, the suction outlet assembly **10** is also provided with a cover **46** adapted to be removably secured to the flange **20** of the sump body **12** (see FIG. **1**). The cover **46** is substantially circular and is dome-shaped (i.e., non-planar). The cover **46** has a top surface **48** (see FIG. **3**) and a bottom surface **50** (see FIG. **4**). As most clearly shown in FIG. **2**, a central section **52** of the cover **46** is perforated

with a plurality of openings **54** (see FIGS. **2-4**) permitting passage of pool water therethrough. The cover **46** includes a small solid center **56** to facilitate injection molding. The openings **54** have an asterisk-shaped pattern such that a plurality of substantially unperforated sections **58** (see FIGS. **2** and **3**) is formed along the periphery of the central section **52** and an opening **60** (see FIGS. **2-4**) is formed in each of the unperforated sections **58**. The positional arrangement of the openings **54** and the unperforated sections **58** enhances the ability of an entrapped bather to peel an article of clothing, such as a swimsuit, or body part off the cover **46** if differential pressure is developed. The cover **46** also has a downwardly curved side portion **62** (see FIGS. **2** and **3**) and a circular flange or lip **64** which extends outwardly from the side portion **62** of the cover **46**. The lip **64** is sized and shaped so as to provide a location for informative lettering.

Referring to FIGS. **2-4**, the side portion **62** of the cover **46** includes a plurality of radially extending slots **66** (see FIGS. **2** and **3**) and a bottom surface **68**. As most clearly shown in FIG. **3**, each of the slots **66** has a U-shaped side wall **70** which extends upwardly from the bottom surface **68**. The slots **66** are sized and shaped so as to exclude foreign objects that may accumulate around the cover **46**. An opening **72** (see FIGS. **2** and **4**) is formed in the bottom surface **68** of each of the slots **66**. The openings **72** formed in the slots **66** are smaller than the openings **54** and **60** formed in the central section **52** of the cover **46** so as to permit passage of pool water through the openings **72** while inhibiting passage of larger foreign objects contained in the pool water. The pattern of slots **66** is discontinuous such that a set of apertures **74** (see FIGS. **1-4**) is formed in the side portion **62** of the cover **46** so as to allow fasteners such as screws (not shown) to be inserted therethrough. The apertures **74** are aligned with a threaded insert **76** formed in the apertures **22** of the flange **20** of the sump body **12** (see FIG. **1**), thereby enabling the cover **46** to be removably secured to the sump body **12** by the screws (not shown).

Referring to FIG. **4**, the bottom surface **50** of the cover **46** includes an annular lip **78** (see FIGS. **3** and **4**) and a plurality of spaced apart protrusions **80** (see FIGS. **3** and **4**) which facilitate the placement of the cover **46** on the sump body **12** and provide support for side forces. A pair of cavities **82** (see FIGS. **1** and **4**) is formed in the bottom surface **68** and is sized and shaped so as to avoid undesirable thick sections in a plastic injection molding process. Similarly, the bottom surface **50** of the cover **46** also includes a plurality of enlarged circular depressions **84** positioned underneath the unperforated sections **58** (see FIGS. **2** and **3**) of the top surface **48** of the cover **46**. The depressions **84** surround the openings **60** (see FIGS. **2-4**) formed in the unperforated sections **58**. Each of the depressions **84** includes an outer wall **86** and an inner wall **88** so as to form a cavity **90** between the outer wall **86** and the inner wall **88**.

In operation, pool water flows into the suction outlet assembly **10** through all of the openings **54**, **60**, and **72** formed in the cover **46** and into the annular space **34** formed between the outer wall **14** of the sump body **12** and the wall **32** of the central stem **30**. Thereafter, the pool water flows from the annular space **34** into the nozzle **28** (as indicated by arrow A in FIG. **1**). The pool water then flows out of the nozzle **28** (as indicated by arrow B in FIG. **1**) to the pump or gravity flow collector vessel.

The present invention provides various safety features for the suction outlet assembly **10**. For example, the non-planar shape of the cover **46** makes it difficult for a bather to completely block all of the openings **54**, **60**, and **72** formed in the cover **46**, thereby avoiding entrapment. Accordingly, the dome-shaped cover **46** prevents the development of an unsafe condition which has existed with conventional covers having a flat configuration.

When the cover **46** is not installed in or is accidentally removed from the suction outlet assembly **10**, the plug **44** and the central stem **30** are positioned within the sump body **12** so as to limit body area that is exposed to the differential pressure between the pool water and the suction piping, thus minimizing entrapping force. Furthermore, the annular space **34** is narrow such that a bather is inhibited from accessing the nozzle **28** with his or her limb body parts, thereby avoiding entrapment.

Referring to FIG. **5**, with the cover **46** (see FIGS. **1-4**) removed from the sump body **12**, a test cap **92** may be mounted to the sump body **12** in order to perform hydrostatic pressure testing of the suction outlet assembly **10**. The test cap **92** includes a dome-shaped body **94** with a top end **96** and a bottom end **98**. The high dome-shaped body **94** insures that the test cap **92** is removed before the cover **46** (see FIGS. **1-4**) is installed, thereby preventing mistaken unsafe operation of a dual-outlet pool with one outlet already blocked. The top end **96** includes a nut **100** and the bottom end **98** includes external threads (not shown) which mates with the threads **26** (see FIG. **1**) formed on the sump body **12**. The bottom end **98** also includes an annular rim **102** sized and shaped so as to compress a sealing component, such as O-ring **104**, used to seal the annular rim **102** of the test cap **92** to the flange **20** of the sump body **12**. When the test cap **92** is mounted to the sump body **12** as shown in FIG. **5**, an annular shield **106** is provided over the flange **20** of the sump body **12** to prevent construction debris, such as concrete overspray, from entering the suction outlet assembly **10**.

The test cap **92** may also be used to cover the suction outlet assembly **10** when the swimming pool is not in use for an extended period of time, such as during the winter months. In this manner, the test cap **92** may be used to inhibit the passage of pool water into the suction outlet assembly **10**.

Referring to FIG. **6**, a hydrostatic relief valve **108** and a collector tube **110** are positioned within the sump body **12**. More particularly, the hydrostatic relief valve **108** is positioned above the central stem **30**, threadedly mates with the internal threads **38** of the central stem **30**, and includes a poppet **112** compressed into a seat (not shown) by a spring **114**. The hydrostatic relief valve **108** is sized and shaped so as to close off the top end of the bore **42** formed in the central stem **30**. A valve stop **116** is attached to the poppet **112**. As will be described in further detail hereinafter, the hydrostatic relief valve **108** functions to relieve excessive hydrostatic pressure in the earth around the pool and to allow a partly empty pool to fill with ground water, thereby preventing floatation of the pool structure.

With continued reference to FIG. **6**, the collector tube **110** is positioned in the bore **42** formed in the central stem **30**. The positional arrangement of the central stem **30** allows the collector tube **110** to be accommodated in the bore **42** with minimum excavation depth. The collector tube **110** has an upper end **118** which includes external threads **120** sized and shaped so as to mate with internal threads **38** formed in the stem **30**. The collector tube **110** has a lower end **122** which is positioned below the central stem **30** and the sump body **12**. The collector tube **110** has a cylindrical body **124** with spaced grooves **126** sized and shaped so as to allow groundwater, but not soil, to pass therethrough. When the pressure of the groundwater under the suction outlet assembly **10** exceeds the pressure of the water in the swimming pool, by more than the valve cracking pressure, the poppet **112** will be moved from

its seat (not shown), thereby permitting groundwater to flow through the grooves **126** formed in the collector tube **110** and into the swimming pool.

A second exemplary embodiment of the present invention is illustrated in FIGS. **7** and **8**. Elements illustrated in FIGS. **7** and **8** which correspond to the elements described above with reference to FIGS. **1-6** have been designated by corresponding reference numerals increased by two hundred. In addition, elements illustrated in FIGS. **7** and **8** which do not correspond to the elements described above with reference to FIGS. **1-6** have been designated by odd numbered reference numerals starting with reference number **211**. The embodiment of FIGS. **7** and **8** operates in the same manner as the embodiment of FIGS. **1-6**, unless it is otherwise stated.

FIGS. **7** and **8** illustrate a suction outlet assembly **210** which includes a cup-shaped sump body **212** with a chamber **211** formed in the sump body **212**. The sump body **212** also includes an outer wall **214** having an upper end **216** and a bottom wall **213**. The sump body **212** has an annulus **217** that extends between the upper end **216** of the outer wall **2.14** and the flange **220**. A nozzle **228** is formed in the outer wall **214** of the sump body **212**.

Referring to FIGS. **7** and **8**, the suction outlet assembly **210** also includes a shroud **219** having a cylindrical, elongated wall **221** which is positioned generally concentrically relative to the outer wall **214** of the sump body **212**. The shroud **219** includes a rim **223** sized and shaped so as to be supported on the annulus **217** of the sump body **212**. The wall **221** of the shroud **219** includes a lower section **225**, an intermediate section **227**, and an upper section **229**. The lower section **225** of the shroud **219** is positioned to block direct access to the nozzle **228** to prevent limb entrapment in the nozzle **228** and downstream piping. The lower section **225** has a diameter which is less than the diameter of the intermediate section **227**, while the intermediate section **227** has a diameter which is less than the diameter of the upper section **229**. The upper section **229** is joined through a gluing or welding process to the upper end **216** of the sump body **212** and has internal threads **231** for purposes to be described hereinafter. An interior chamber **242** is formed in the shroud **219**, extending along the entire length thereof.

A plurality of external crenellations **233** (three of six are illustrated in FIG. **7**) extend from the rim **223** of the shroud **219** and are spaced around the sump body **12**. The external crenellations **233** hold a bather away, preventing the formation of a peripheral seal. Like the central stem **30**, the shroud **219** prevents limb access to the outlet nozzle **228**.

A hydrostatic valve **208** is positioned at the bottom of the sump body **212** so as to close off a hole **235** (see FIG. **8**) formed in the bottom wall **213** of the sump body **212**. The suction outlet assembly **210** also includes a collector tube **210** positioned below the hydrostatic relief valve **208**.

With reference to FIG. **8**, a hydrostatic pressure test cap **292** may be mounted to the shroud **219** to perform hydrostatic pressure testing of the suction outlet assembly **210**. The test cap **292** includes a domed-shaped lid **294**, a nut **296** and a skirt **298**. The skirt **298** depends from the lid **294** so as to threadedly engage the internal threads **231** (see FIGS. **7** and **8**) formed on the shroud **219**. When the test cap **292** is mounted to the shroud **219** as shown in FIG. **8**, the hydrostatic relief valve **208** and the collector tube **210** are removed and a plug **239** is placed over the hole **235** formed in the sump body **211**. The piping may also be tested with the hydrostatic relief valve **208** (see FIG. **7**) in place of the plug **239**.

It will be understood that the embodiments described herein are merely exemplary and that a person skilled in the art may make variations and modifications without departing from the spirit and scope of the invention. For example, the number of crenellations **233** (see FIG. **7**) can vary. The asterisk-shaped pattern of the openings **54** formed in the cover **46** is merely exemplary, and the openings **54** can be arranged in other patterns. All such variations and modifications are to be included within the scope of the invention.

We claim:

1. A suction outlet assembly, comprising:

a sump body including a substantially cylindrical outer wall, an outlet nozzle formed in said outer wall, and an upper flange, and a hollow central stem having an open upper end proximate said upper flange, said central stem disposed within said outer wall so as to form an annular space between said central stem and said outer wall, said annular space communicating with said outlet nozzle and being dimensioned so as to inhibit the insertion of human body parts therein, and a removable plug adapted to engage and seal said open upper end of said central stem, said removable plug preventing passage of fluid through said open upper end of said central stem, said outlet nozzle sized to allow fluid in the annular space to pass out of said sump body through said outlet nozzle, said central stem having a lower end integrally formed with a lower end of said outer wall of said sump body, said lower end of said central stem and said lower end of said outer wall of said sump body formed from the same material.

2. The suction outlet assembly of claim **1**, wherein the removable plug is solid.

3. The suction outlet assembly of claim **1**, wherein the removable plug is sized to completely cover the open upper end of said central stem.

4. The suction outlet assembly of claim **1**, wherein said lower end of said central stem curves outwardly toward said sump body.

5. The suction outlet assembly of claim **4**, wherein said central stem and said outer wall of said sump body cooperate to form a closed bottom.

6. The suction outlet assembly of claim **1**, wherein said removable plug prevents passage of fluid from a swimming pool through said open upper end of said central stem while fluid passes through the annular space.

7. The suction outlet assembly of claim **1**, wherein said lower end of said central stem and said lower end of said outer wall of said sump body are positioned below said outlet nozzle.

8. A suction outlet assembly, comprising

a. a sump body that includes:
   i. a substantially cylindrical outer wall,
   ii. an outlet nozzle formed in the outer wall, and
   iii. an upper flange, and

b. a hollow central stem that defines an open upper end proximate to the upper flange,

wherein the hollow central stem is configured within the outer wall so as to form an annular space relative to the outer wall, the annular space communicating with the outlet nozzle; and

wherein the annular space is dimensioned so as to inhibit receipt of human body parts therein; and a removable plug adapted to engage and seal said open upper end of said central stem, said removable plug preventing passage of fluid through said open upper end of said central stem, said outlet nozzle sized to allow fluid in the annular space to pass out of said sump body through said outlet nozzle, said central stem having a lower end integrally formed with a lower end of said outer wall of said sump

body, said lower end of said central stem and said lower end of said outer wall of said sump body formed from the same material.

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